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Exploring pedagogical decision making from the lens of science teachers in response to different pedagogical issues☆

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ABSTRACT:

The success of an educational process is represented by success in making appropriate decisions. This study aims at exploring pedagogical decision-making by science teachers in dealing with pedagogical issues based on their point of views. Three demographic variables: teacher's gender, school stage, and teaching experience were investigated. The sample of the study was composed of (568) science teachers in grades (1–12) in the Sultanate of Oman. To achieve the objectives of study, it followed the descriptive method based on a questionnaire was prepared and administered to collect data from the targeted sample. The results of the study showed that the first decision science teachers made while dealing with pedagogical issues was seeking advice from supervisors and senior teachers followed by relying on personal experience and continuing with the current practice. Furthermore, the results indicated a statistically significant difference in some options in favor of female teachers, cycle one's teachers, and teachers with less than ten years of experience. The study concluded with a set of recommendations in the light of findings.

1. Introduction

Today, science plays a prominent role in contemporary life. Thus, the development of science and technological applications have a significant impact on science curricula. Many countries around the world are seeking to keep pace with these developments through the development of science teaching. In Oman, many projects were initiated in order to develop the science curricula and to keep pace with the continuous change in science teaching. In Oman, a new project has been launched recently for the adaptation of international series of science teaching known for the Cambridge Series. The Cambridge Series have been translated into Arabic as Arabic language is the official language of teaching Science and Math in Oman in the academic year 2017/2018. However, achieving future objectives in science requires professional competencies that science teachers should possess. Omani science teachers, just similar to other teachers, face some challenges while implementing the international series in the classroom. As a consequence, there is a need to investigate how teachers deal with pedagogical issues that have risen in order to support and guide them towards the right ways to overcome such issues.

Previous researches in science education indicate that there are some obstacles and challenges in teaching science effectively. One of these obstacles is the lack of resources and teachers' limited knowledge about content. Also, some teachers may not implement new instructional methods of science teaching because they have not been exposed to these methods themselves while being prepared to become science teachers or because they are less convinced about the possibility of improving science teaching (Barak, 2016; Bell et al., 2013; Jimoyiannis, 2010).

In essence, the development process in any educational system is based on three basic pillars: the teacher, the curriculum, and the student. Teachers, who deal directly with the students, have a great role in the shaping and refinement of their students' minds, in directing their learning process, and in preparing them to meet the challenges of the present and the future. It is the competent teachers who, through these various roles and responsibilities, can translate goals into learning experiences for students to interact with them and to expand their understanding. Competent teachers may also develop their students' mental abilities, lead the learning process towards the right path, and cover any shortage of curricula, programs and materials. As such, the

; PMD, pedagogical decision-making.

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educational system must consider the characteristics of teachers, their educational practices, and their decisions and roles in order to carry out their mission as effective teachers. Al-Mafaraj et al. (2007) explained that a teacher may have many options when experiencing problems in the field of education, such as reading topics about the field of specialization from books and the internet, visiting classrooms of distinguished teachers, conducting action research, participating in specialized forums to benefit from the experiences of others, and attending conferences seminars and workshops. Therefore, pedagogical decision-making enables teachers to deal critically with the challenges that are encountered during their teaching practices and consequently the success of teachers in teaching depends on their skills to choose the right decision-making when facing such challenges.

Through the experience of researchers in supervising science teachers, they noticed differences among teachers in dealing with challenges encountered while teaching science. Because of the importance of pedagogical decision-making and the lack of research in this area, particularly in Oman and the Arab World, the researchers believed that this research would be very important regarding how science teachers deal with common challenges and issues in classrooms.

2. Theoretical background

Decision-making is an important part in all aspects of our life and all professions. This is also the same in the educational setting where teachers are required to make many decisions related to their teaching practices to solve encountered challenges. Teachers' practices reflect the role assigned to them moving from conventional practices to advanced ones. Teachers' task is to enable learning rather than to transfer knowledge (Ross, 2000). Therefore, their role requires enabling students to learn, think, understand and act (Ball & Forzani, 2009). Best practices in teaching are related to the content and processes of teaching in order to develop and improve teaching strategies (Scheerens, 2013). Classroom practices include a set of procedures performed by a teacher to support student's learning (Colley & Windschitl, 2016; Li & Oliveira, 2012; Windshitl et al., 2012). Pedagogical practices comprise teaching methods, activities and assessment techniques in order to achieve the goals of science education.

To realize successful science practices in teaching, priority should be given to the engagement of students in the teaching and learning process (Regan, 2013). Teachers should provide students with opportunities to plan and implement investigations in order to gain the science process skills such as identifying variables, using appropriate tools to data and analyzing data to answer the inquiry questions (National Research Council, 2012). Kloser (2014) presented nine science teaching practices that should be considered. These are: 1) engaging students in investigations; 2) facilitating classroom's discourse; 3) eliciting, assessing and using student thinking about science; 4) providing feedback; 5) constructing and interpreting models; 6) connecting science concepts to applications; 7) linking science concepts to phenomena; 8) focusing on core science ideas and practices; and 9) building classroom community.

Danielson (2008) has developed a framework that consists of four domains for professional practices that teachers can use as a guide to improve students' learning. Under each domain, there is a set of elements as follows: The first domain is "planning and preparation" which consists of demonstrating knowledge of content, pedagogy and students, setting instructional outcomes, demonstrating knowledge of resources, designing coherent instruction and designing student assessments. The second domain is "classroom environment", which consists of creating an environment of respect and rapport, establishing a culture for learning, managing classroom's procedures, organizing physical space and managing students' behavior. The third domain is "instruction" which consists of communicating with students, engaging students in learning, using questioning and discussion's techniques, using assessment in instruction and demonstrating flexibility and responsiveness. Finally, the fourth domain is "professional responsibilities" which consists of reflecting on teaching, communicating with families, participating in a professional community, maintaining accurate records, growing and developing professionally and showing professionalism.

The decisions made by the teacher affect student's learning (McMillan, 2003). Therefore, teachers' decisions about their teaching practices should be made on an ongoing basis. Teaching is not a set of best practice that works in all situations, rather a professional diagnosis of a dynamic classroom environment and the ability to make a decision that requires careful selection from many alternatives how to proceed (Olson et al., 2016). Decision-making involves considering a particular topic or issue and determining the final outcomes. Then, identifying options to achieve the desired final outcomes. After that, the most appropriate option is selected to find out solutions for a topic or an issue. Since teaching is about making decisions (Griffith & Lacina, 2017), the right decision requires teachers to think deeply before making it. Teachers should also take their responsibility and benefit from their past experiences to ensure that mistakes are not repeated (Abdelaal, 2020). Practices that are performed by teachers are due to the result of pedagogical decisions made by themselves. These decisions contribute to the formation of teaching paradigm for teachers as well as making them more professional (Prachagool et al., 2016). Perkins (2009) explained that, for a decision to be right, it must be based on sufficient information and understanding elements of the situation. The problem or challenge, that person needs to decide, should take into account objectives, values, costs, side-effects and time pressure. Al-Adwani and Al-Azmi (2018) added that the decision-making process requires skill, imagination, creativity, logical scientific thinking and advance planning. On the other hand, poor decision-making reflects the lack of self-regulation and the lack of clarity in the goals of individuals and groups (Al-Adwani & Al-Azmi, 2018).

It can be argued that making appropriate decisions about teaching practices by teachers will lead to effective learning. Thus, these decisions include everything teachers do either inside or outside a classroom to develop students' personalities, cognitive abilities and practical skills, and improve their attitudes towards learning. These decisions include; for example, delivering scientific contents to students, allowing the diversity of teaching and assessment methods, stimulating students' motivation, utilizing various resources and providing professional development opportunities (Stronge, 2018; Tomlinson, 2017).

Jarwan (2010) defines decision-making as a complex thinking process, which aims to choose the best alternatives or solutions available for individuals in a particular situation, in order to achieve a desired goal. As for the pedagogical decision, Al-ser (2016, p.284) defined it as "teacher's choice for the best alternative, from her/his point of view, among a group related to a specific teaching behavior carried out by the teacher regarding a specific situation in a classroom". Based on this definition of teaching decision-making, the teacher must realize the environmental stimulus in the classroom environment and form a need to respond to it. Then, it filters and interprets these stimuli, which leads to a decision to act, which follows with behavior and to take further action or not to act. (Sutcliffe & Whitfield, 2018).

Al-Qattan (2016) pointed out that decision-making process, especially in unexpected situations, requires teacher's expertise to make optimal decision. Teachers' undergoing through various types of situations can acquire many skills that would help them in identifying alternatives and making an appropriate decision. Pedagogical decision-making is affected by teachers' beliefs, values and philosophy in education; as well as, by external influences imposed on them (McMillan, 2003 & Siuty et al., 2018). Torun (2019) argues that not all people follow a logical and scientific path while making decisions because their decisions may be based on beliefs and emotion. These decisions are irrelevant if they pertain to individuals and it will hinder any progress if these decisions cause an impact on a larger group of people. Halverson et al. (2009) found that there are few students' colleges that rely on scientific principles when formulating their decisions.

When they make the teaching decision, they must differentiate between alternatives and solutions on the basis of the advantages and disadvantages associated with them. Then, they would be able to make a proper decision.

In many occasions, decisions made by teachers are considered to be a response to challenges faced while practicing teaching. Science teachers face many challenges and difficulties that arise from their practices. To deal with these challenges, teachers should use ideas, methods and practices that contribute to adapting the classroom environment according to goals rather than challenges and difficulties (Sharari, 2011; Swainston, 2008). Teachers can do this only when having competencies that make them able to overcome challenges and difficulties in achieving the science teaching's goals and developing students' mental, emotional and behavioral capabilities. Nasri et al.'s (2010) revealed the problems facing teachers of science in Malaysia are shortage in resources, laboratory equipment and administrative burdens. Similarly, Al-Balushi (2019) pointed out that there are some challenges facing teaching science in Omani schools. The first challenge is the limited number of training programs that are provided to science teachers especially after the recent reformation of curricula and assessment. The second challenge is the limited application of some enrichment programs that have been in place in some schools such as STEM and Green Schools. The third challenge is the lack of societal participation from the private sector's institutions to support the projects of science teaching. Yet, the Ministry of Education is doing its best in collaboration with the public and private sectors to overcome these obstacles.

Teachers need to be competent in different teaching proficiencies in order to make proper decisions. There are a number of studies explored Omani teachers' proficiency. For instance, Al-Hashmi et al. (2018) found that Omani teachers had moderate professional competencies from the students' point of view. Nwavila and Yamani (2014) reached the same conclusion by analyzing the view of senior teachers and supervisors. Ambusaidi et al. (2013) also found that Omani teachers' possession of competencies for teaching and learning, personal and professional growth and characteristics of students' development were acceptable from the point of view of their supervisors. These findings showed that teachers in grades 11 and 12 do not reach the level required for diversification of learning and teaching methods that drive students' higher levels of performance (Issan & Shidi, 2018).

At regional and international levels, Al-Baqmi (2019) showed that the practice of Egyptian secondary science teachers according to teachers' standards and careers' paths was at medium level in the planning criteria and the students' interactive and supportive learning environments; while, the practice was weak when it comes to students' performance standard. Sutikno and Treagust (2004) found that teacher practices in Indonesian rural schools in science classes were teacher-centered. However, the experienced science teachers combined student-centered and teacher-centered by using multiple assessment techniques, teaching approaches rather than students-centered and creating an effective learning environment. They also explained factors influencing instructional practices such as teachers' content knowledge and their beliefs about teaching.

The current study examines teaching decisions that science teachers take to overcome challenges and obstacles faced during teaching science curricula from their point of view. There is no doubt that these decisions will affect their teaching practices, their teaching identity and students' achievement. It focuses on finding the approaches that science teachers in Oman are used to make their decisions about pedagogical issues. In addition, there is a shortage of studies dealing with how science teachers make their pedagogical decision at least in Oman and Arab countries. Previous studies addressed to what extent those teachers have to acquire decision-making skills and the type of skills to be possessed. However, they did not address the nature of decision-making. Therefore, this study may add value to the educational literature that is related to pedagogical decision-making nationally and internationally.

2.1. Research questions

The current research aimed to answer the following questions:

1. What is the nature of science teachers' pedagogical decision-making (PDM) in response to different pedagogical challenges from their point of view?
2. Are there any statistically significant differences in science teachers' pedagogical decision-making (PDM) from their point of view due to teacher gender, school stage they teach and their years of experience?

3. The context

The Sultanate of Oman is situated in the far southeastern corner of the Arabian Peninsula. It shares borders with the Republic of Yemen to the southwest, the Kingdom of Saudi Arabia to the west and the United Arab Emirates to the north. The education system is divided into three stages. In Oman, public school education includes basic and post-basic education. Basic education is divided into two cycles: the first cycle is for grades (1–4), in which students of both genders study in joint classes, and the teaching staff in these schools are female. The second cycle is for grades (5–10), male and female students learn in separate schools based on their type of gender, and the teaching staff is determined according to the type of gender too. In other words, male staff is usually assigned to a boys' school and female staff is assigned to a girls' school. Similarly for post-basic education for grades (11–12), male and female students also learn in separate schools based on their gender types, and the teaching staffs are assigned according to gender types respectively (The Education Council, 2014). Science is taught by only one integrated book embracing Biology, Chemistry and Physics in grades (1–8); whereas, these science subjects are taught separately by using a separate textbook for each subject in grades (9–12).

4. Methodology

The researcher followed the descriptive study based on a questionnaire. This type of methods has the advantage of surveying large number of respondents.

Participants: The study sample included (568) science teachers selected randomly in Oman from three educational governorates in the academic year, spring 2020 (Table 1).

Instrument: A questionnaire was used to identify the common pedagogical decisions that science teachers make in dealing with pedagogical issues. Ten educational situations or incidents representing pedagogical issues in which the teacher responds to them according to a five-point scale (always, frequently, sometimes, rarely, never). These pedagogical issues were drafted after reviewing educational literature related to pedagogical issues (Mohammed et al., 2016 & Al-Qasim & Asiri, 2016). These situations included planning, student's low achievements, students' misconception, employing technology in teaching, involving students in the teaching process, feedback and formative assessment, classroom interaction, individual differences and encouraging students to be creative and innovative. A set of options for each situation is presented to the teachers to show their decisions about the situations.

Table 1
Distribution of sample according to the research variables.

Study variable	Gender		School Stage			Years of Experience	
	M	F	1st Cycle (Grades 1–4)	2nd Cycle (Grades 5–10)	Grades (11–12)	Less than 10 years	10 years and over
No.	176	392	233	204	131	144	424

These options include attending classes of distinguished teachers, drawing on the experience of others, utilizing educational researches, relying on personal experience, continuing the current practice without any change, relying on educational books and pedagogy guides, and attending training courses and workshops. The following is an example of a situation given to teachers:

> "If you notice that you have a disparity in the levels of your students and have problems considering individual differences, how do you act towards this challenge?
>
> The decisions that are given to teachers to select from are:
>
> - I will attend the classes of other science teachers to learn how they encourage their students' creativity and innovation.
> - I will seek for advice from experienced teachers, senior teachers or subject supervisors.
> - I will continue teaching by the conventional way and try to overcome students' differences.
> - I will use the findings and recommendations of previous researches and educational studies on how to best overcome students' differences.
> - I will rely on my personal experience to overcome students' differences.
> - I will read educational books related to overcome students' differences.
> - I will attend courses and workshops on how to overcome students' differences.

The questionnaire was validated by seven experts in science teaching. They were asked to provide their comments and suggestions on the pedagogical issues in terms of their clarity and suitability, and any suggestion that they deem appropriate in terms of modification, addition or deletion. One suggestion was to limit the situation or incident presented to nine or ten. Another suggestion was to write an option about using specialized books to face the challenge. To check the reliability of the questionnaire, it was administered to 67 students. Then, the internal consistency was calculated using the Cronbach Alpha reliability coefficient and the result was (0.93). This value indicates that the present questionnaire is consistent and reliable for the purposes of collecting the needed data of this research.

5. Data analysis

Fig. 1 shows the statistical methods that were used to answer each research's question.

The statistical methods used to answer the research questions.

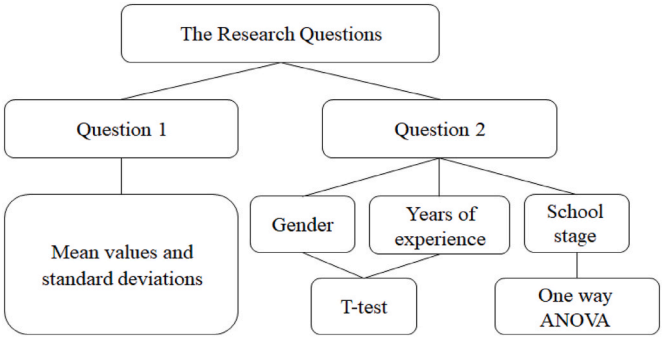

Fig. 1. Statistical methods used to answer the research's questions.

6. Results and discussion

6.1. Nature of science teachers' pedagogical decision-making (PDM)

Q1 Results: What is the nature of science teachers' pedagogical *decision-making* (PDM) in response to different pedagogical challenges from their point of view? To answer this question, mean values and standard deviations have been calculated for all teachers' responses. To identify pedagogical decision estimation categories, the range length is calculated as follows:

Category length = (highest value in scale – smallest value in scale) / number of scale categories

Then, the category length is added to the smallest value in the scale to get the first category, and later on the category length is added to the upper category limit for the second category, and so on until the last category is reached. Table 2 shows the categories of teacher's estimation on the components of the scale and the estimate of each category. Mean values and standard deviations of teachers' pedagogical decision were calculated as shown in Table 3.

The results showed that the mean values of all pedagogical decision scale were high across all options except in one option which is "continue with the current practice". These results indicate that teachers make the decision to take advantage of the experiences of others when they face any pedagogical issue, and this may be because of the availability of experience around them, so the teacher can have his or her colleagues and the senior teacher at a school. In Oman, in each school, there is a senior teacher or a subject coordinator who helps other teachers to improve their teaching practice (Al-Oraimi et al., 2014; Ibrahim & Alkatiri, 2020). The supervisor also plays a crucial part in the process of overcoming challenges and difficulties that teachers may encounter. This is in line with the study of Al-Ghanami (2016) that stated there was a positive role for supervisors in developing teachers' performance. The next option of science teachers' decision-making to overcome the pedagogical issues is relying on personal experience. This seems acceptable because the sample of study included 424 teachers with teaching experience about 10 years and more; therefore, they may believe in relying on colleagues' experience to tackle the problems. The results show that teachers are keen to employ the results of educational research because of the importance of research in adding new insight to the educational field; in addition to, its role in inventing new ideas and solutions to overcome educational problems raised in the educational field (Al-Afandi, 2018). A successful teacher is a teacher who seeks to overcome problems by implementing scientific means and methods. In Oman, the Ministry of Education (MOE) is keen to provide teachers with scientific research skills by freeing them to complete postgraduate studies. It also encourages teachers to conduct educational research which is very important to enhance their teaching practice. The option "continue with the current practice" received a low-level. This may mean that teachers do not opt for this solution unless they struggle and could not find other solutions.

6.2. Variations in pedagogical decision-making due to teacher's gender, school's stage and years of experience

Q2 Results: Are there any statistically significant differences in

Table 2
Teacher levels categories of pedagogical decision.

Weighted average value Categories	Practice level
1–1.80	Very low
1.81–2.60	Low
2.61–3.40	Medium
3.41–4.20	High
4.21–5.00	Very high

Table 3
Mean values and standard deviations of teachers' pedagogical decision.

Option	M	SD	Order	Practice level
Attend lessons of other teachers	3.69	0.82	4	High
Seek advice from my supervisors and senior teachers	4.04	0.66	1	High
Utilization of educational research	3.60	0.83	6	High
Rely on personal experience	4.02	0.45	2	High
Continuing with the current practice	2.32	0.84	7	low
Rely on educational books, references and teacher guide	3.98	0.70	3	High
Attend training courses and workshops	3.68	0.77	5	High

science teachers' pedagogical decision-making (PDM) from their point of view due to teachers' gender, school stage they teach and their years of experience? To answer this question, several statistical methods have been used by variables:

6.2.1. Gender

Independent sample *t*-test was used to identify the differences between genders (Table 4).

Table 4 shows that there are statistically significant differences in five options; four in favor of female teachers and one in favor of male teachers. This indicates female teachers' keenness to make pedagogical decisions that help them to improve their teaching process, such as attending classes of their colleagues, benefiting from the experiences of others, relying on educational books and teacher's guide, and attending training courses and workshops. As for the options that were in favor of male teachers, it is continuing with the current practice. The reason for this may be originated from the teaching profession at least in Oman since it attracts females more than males. In Oman, teachers of cycle one (grades 1–4) are all females, and the percentage of Omani male teachers in cycle two schools (5–10) reached 80.4%, and 75% in grades (11–12)'s School; while, the percentage of female teachers in the cycle two schools reached 95.3%, and 93.2% in grades (11–12) according to the statistics of academic year 2018/2019 (The Ministry of Education, 2019). This is confirmed by a recommendation from the Education Council to launch a study on the reluctance towards teaching professions in the Sultanate of Oman especially by male teachers.

It is also noticeable that female teachers do not change their professions as teachers; while, male teachers seek for changing into administrative jobs or moving to other institutions. This outcome corresponds to the study of Nwavila and Yamani (2014), which has demonstrated that female teachers performed better in teaching science than male teachers from the personal perspectives of senior teachers and supervisors. There was not any statistically significant difference between male and female teachers in terms of pedagogical decision making related to the utilization of educational researches and relying on personal experience. This means that both genders using the similar practices or strategies to deal with pedagogical issues and challenges. Moreover, this result contrasts with Qaid's study (2012), which indicated that there is an agreement between males and females in the level of decision-making in dealing with most school situation.

Table 4
Mean values, standard deviations and the "t" value of pedagogical decision-making due to gender variable.

Option	gender	N	Mean	SD	df	t	Sig.
Attend lessons of other teachers	M	176	3.41	0.88	266	5.72	.001
	F	392	3.82	0.76			
Seek advice from my supervisors and senior teachers	M	176	3.82	0.75	266	5.13	.001
	F	392	4.13	0.60			
Utilize educational research	M	176	3.52	0.90	266	1.52	.129
	F	392	3.64	0.80			
Rely on personal experience	M	176	4.07	0.43	266	1.91	.057
	F	392	4.00	0.46			
Continue with the current practice	M	176	2.42	0.84	266	1.96	.050
	F	392	2.28	0.84			
Rely on educational books, references and teacher guide	M	176	3.87	0.77	266	2.71	.007
	F	392	4.03	0.65			
Attend training courses and workshops	M	176	3.51	0.86	266	3.58	.001
	F	392	3.76	0.72			

6.2.2. School's stage

One way ANOVA was used to identify the differences in pedagogical decision-making due to school's stage that the teachers teach Table 5.

It is noticeable that there are differences in science teachers' pedagogical decision-making due to stage level in five options as shown in Table 5. As a consequence, the Scheffe's post-hoc test was carried out to determine the direction of these differences. The results indicate that there are statistically significant differences in favor of cycle one's teachers in the five options of study. This is because most of the new appointments for teachers in the last five years were for female teachers due to the high demand in this cycle. It has been stated in advance that all teachers in cycle one of government schools are females. Most teachers are fresh graduates who are qualified and prepared to teach cycle two and grades 11 and 12, but not for cycle one. Therefore, cycle one's teachers are keen to make their own decisions that help them solving issues and problems encountered by attending other teachers' lessons, seeking advice from supervisors and senior teachers, utilizing

Table 5
One way ANOVA results due to the school stage that the teachers teach.

Option	School Stage	N	Mean	SD	F	Sig.
Attend lessons of other teachers	Cycle One	233	3.97	0.68	27.57	.001
	Cycle Two	204	3.57	0.84		
	Grades 11-12	131	3.38	0.84		
Seek advice from my supervisors and senior teacher	Cycle One	233	4.20	0.57	11.99	.001
	Cycle Two	204	3.95	0.69		
	Grades 11-12	131	3.89	0.72		
Utilize of educational research	Cycle One	233	3.76	0.80	7.135	.001
	Cycle Two	204	3.50	0.85		
	Grades 11-12	131	3.48	0.84		
Rely on personal experience	Cycle One	233	3.99	0.48	1.29	.275
	Cycle Two	204	4.02	0.46		
	Grades 11-12	131	4.07	0.40		
Continue with the current practice	Cycle One	233	2.34	0.92	1.00	.369
	Cycle Two	204	2.26	0.78		
	Grades 11-12	131	2.39	0.80		
Rely on educational books, references and teacher guide	Cycle One	233	4.12	0.62	8.13	.001
	Cycle Two	204	3.90	0.74		
	Grades 11-12	131	3.87	0.71		
Attend training courses and workshops	Cycle One	233	3.84	0.66	8.78	.001
	Cycle Two	204	3.59	0.86		
	Grades 11-12	131	3.54	0.77		

educational researches, relying on educational references and teacher's guide and attending training courses and workshops. Moreover, the nature of teaching at cycle one is different from other cycles. There are more time and opportunities for teachers in cycle one to develop students' skills compared to the time and opportunities that are available to teachers of higher grades. The later teachers focus mainly on delivering the curriculum content. Therefore, they do not have much time to use different ways to make right decision about the pedagogical issues and problems encounter them. In other words, teaching at cycle one is more flexible for teachers in terms of times and age group of students to make better decisions for their practice. Al-Qattan's (2016) showed that there were statistically significant differences with unexpected situations between primary school teachers and high school teachers in favor of high school teachers. Teachers at higher grades deal with students, who are older in age, to help them choosing the appropriate alternative of decisions in line with the situation.

6.2.3. Teachers' years of experience

Independent samples t -test was used to identify the differences in pedagogical decision-making in terms of dealing with issues and problems according to years of experience (Table 6).

The results in Table 6 show that there are statistically significant differences in pedagogical decision-making due to teaching experience in three options in favor of teachers with less than 10 years of experience. The early years of teaching are usually hard and novice teachers need a lot of support from others such as from school's supervisors and senior teachers. In addition, these years shape teacher's personality and how they perceive the teaching process in the future. Wiswall (2013) pointed out that the practice of teaching after early years contributes slightly to the quality or effectiveness of the teacher in the classroom. The reason could be that science teachers with less than ten years of experience need to make decisions about how to tackle or solve pedagogical issues very quickly. The easiest ways to do so are attending lessons conducted by other teachers, seeking advice from their supervisors and senior teachers. Although other options such as utilization of previous research, which requires time, or the use of educational books and references, which may not be available to teachers, are more practical, they may require more time and effort from teachers. In addition, the study of the Ministry of Education and the World Bank (2012) confirmed the lack of interest of Omani teachers in reading and learning about new things whether in the field of education in general or in the field of their specialization in private. Moreover, teachers, who have less than 10 years of experience, make their decision by attending any training course or workshop and this is because all fresh teachers in Oman are subjected to undergo training programs in their first year offered by the Specialized Center for Professional Training of Teachers. This program aims to develop teachers' competencies in order to become effective teachers enabling them to improve students' learning outcomes.

It is very obvious from above findings that there is not any significant difference between teachers with less than 10 years of experience and with those owning 10 years of experience and more in terms of using their personal experience to make their decision about pedagogical issues. This result is contrary to what has been found by Al- Shishini & Al-Serengawi (2019) that stated teachers rely on their own experience in order to make decisions because experience provides them with sufficient information and awareness about the elements of situation that are vital in making proper decisions.

Table 6
Mean values, standard deviations, and the t -value in the instructional practices due to years of experience variable.

Options	Years of Experience	N	Mean	SD	Df	t-value	Sig.
Attend lessons of other teachers	Less than 10 years	144	3.89	0.70	566	3.46	.001
	10 years and over	424	3.62	0.84			
Seek advice from my supervisors and senior teacher	Less than 10 years	144	4.20	0.51	266	3.40	.001
	10 years and over	424	3.99	0.70			
Utilize of educational research	Less than 10 years	144	3.67	0.78	566	1.12	.265
	10 years and over	424	3.57	0.85			
Rely on personal experience	Less than 10 years	144	4.02	0.47	566	0.12	.908
	10 years and over	424	4.02	0.45			
Continue with the current practice	Less than 10 years	144	2.44	0.94	566	1.91	.056
	10 years and over	424	2.28	0.81			
Rely on educational books, references and teacher guide	Less than 10 years	144	4.07	0.62	566	1.81	.071
	10 years and over	424	3.95	0.72			
Attend training courses and workshops	Less than 10 years	144	3.80	0.63	566	2.05	.041
	10 years and over	424	3.64	0.81			

7. Conclusions, recommendations and implications

To help students in learning, a series of decisions must be made. Teachers are the main decision makers in the classroom who can understand students' learning needs, recognize the strengths and weaknesses of teaching, and use the opportunities available to improve students' learning. The current study shows that science teachers make pedagogical decisions mainly based on advices obtained from their supervisors and senior teachers followed by their personal experience. In addition, there were statistically significant differences in some options in favor of female teachers, teachers in cycle one schools, and teachers with less than 10 years of experience. Accordingly, the current study suggests that there is a necessity for conducting training programs targeting teachers. These programs have to provide them with appropriate decision-making skills. This can be done through providing teachers with exact real pedagogical problems from the classrooms of our daily real-life context so that they will not see these problems and issues as strange or something never exists. Moreover, these teachers should be subjected to intensive training programs on how to conduct educational researches to improve their teaching skills and styles. In this regard, action research, which is considered as one of common types of researches' methodology, might be a very appropriate manner to be applied by researchers in future. Action research is important in adding meaningful credits to teachers' personal experiences. Action research usually seeks for more practical information that allows any researcher knowing more about a specific problem, realizing its components and putting action plans to solve it. The work of action research ultimately leads to improve the performance of teachers (Aguilar-de Borja, 2018; Hamada, 2019; McKay & Marshall, 2001).

As it is the case with the majority of research, a number of limitations should be noted. The first limitation is the limited number of teachers who participated in the study. Hence, it is very important to conduct more research in this area by targeting a larger sample. The second limitation is the tools used in the current research were limited to quantitative tools. Therefore, it is recommended examining this area of research by using qualitative tools such as interview and classroom observation.

CRediT author contribution statement

Abdullah K. Ambusaidi: Conceptualization, Validation, of the research instrument, Reviewing of the original first draft. **Fatema Y. Al-**

Maqbali: Distribution of the research instrument, Formal analysis, Writing of original first draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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